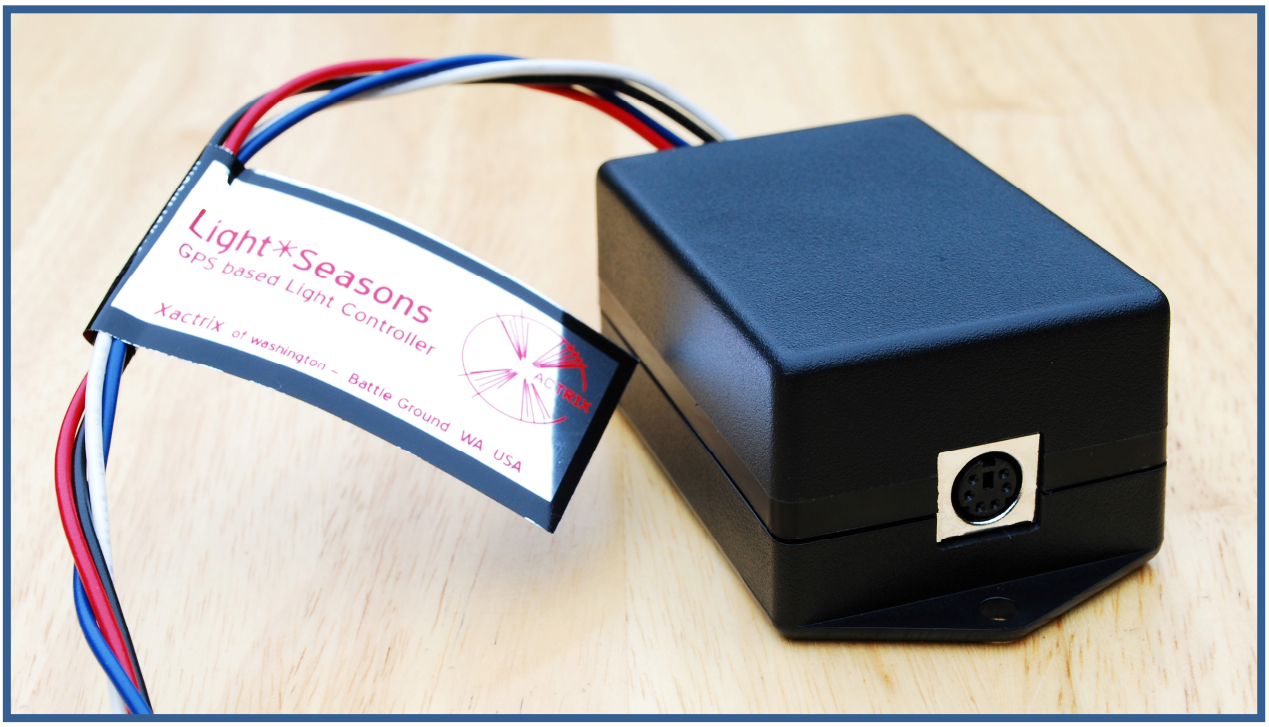
Light*Seasons

GPS based Light Controller

User Manual



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Operation

Your new LightSeasons is an event scheduler, much like a multitasking alarm clock. It has an internal Real-Time-Clock (RTC) to accurately schedule, and reliably execute daily events. When triggered, the preprogrammed task will either energize/release the Load device. LightSeasons is an excellent fit for a Solar-Powered Light Controller.

LightSeasons divides the year into eight unique schedules, or Seasons. Each Season has four programmable tasks/events repeated every day. The Default tasks are tailored for night-time lighting. The Season start date (month/day) is user programmable. Overall duration is defined by this date, and the Start Date of the next season. To increase or shorten a Season's extent, modify the Start Date or its neighbor's. Seasons are labeled one thru eight, and are always executed in order. Season One begins January First. December 31st ends Season Eight. Should Seasons over-lap, the lower Season is executed.

The four trigger events (numbered zero thru three) operate independent of one another. For each trigger defines a scheduled time (hour: minute), and a task (ON or OFF). With every new minute, all the triggers are reviewed looking for a time match. The search begins with Trigger Zero. And only the first 'match' is performed; one task per minute is allowed.
NOTE: A TASK is EXECUTED ONLY AT THE PREPROGRAMMED TIME. 'Time-Ranges' are implied with ON at this time, and OFF at that time. However, this is not how this device operates. It does Not Range check to verify the Load state between triggers.

For accuracy and reliability the internal RTC is driven from quartz crystal. And to increase ease, and reduce ambiguity, the RTC operates on a 24 hour clock. It does not accept AM or PM values. For all PM entries, add twelve (12) to the PM hour. For example 5:00PM is 17:00 hours. And Midnight is 0:00. The intended LightSeasons power source is a large capacity battery... thus there's no internal battery. The present time is lost with the lack of power. As a precaution during a brief power outage, the restored time/date is recouped from the last saved value. The active time is saved every ½ hour, and the new Date is saved at midnight.

A GPS (Global Position Satellite) Receiver comes standard with LightSeasons. The GPS is the easiest, error-free way to update the Time, Date, and Location. There are no settings, switches, and/or parameters to set... it's Plug-N-Play! This small black pod has a 6ft (1.84m) cable with a mating PS2 connector. Insert it into the LightSeasons noting the correct orientation. Place the pod in the open area (as much as possible). The GPS is highly sensitive, and will soon detect Satellites overhead. It is equipped with an indicator light: When lit solid, the Receiver is powered. When flashing, it is synced to a satellite. Note: The included GPS Model may vary. This GPS picture is for reference only.

Procedure to 'Auto-Set the Time and Date.

Simply plug the GPS into the LightSeasons; It is acceptable to connect/disconnect the GPS with the power on.
This procedure may take several minutes to complete:

1. LightSeasons must be on.
2. The GPS light will illuminate, indicating it has power.
3. LightSeasons will confirm its communicating with the GPS by activating the Load Output (Lights come on).
4. The GPS will begin to Flash when it's 'sync's' with a Satellite.
5. Wait for LightSeasons to toggle (blink) the Load/Lights On for 1 second and Off for 1 second. This indicates the GPS time, date, and Geo-Coordinates are received and saved.
6. Remember to unplug the GPS, for it is a Power Drain! The Load/Lights will continue to on or blink while the GPS is active.
7. Note: The time/date provided by the GPS is per Zulu or Greenwich Mean Time. Thus the correct Zulu (GMT) time-zone offset must be saved prior to acquiring the GPS time; the Zulu_Adjust default is Pacific Standard Time (-7 hours). Modify Zulu_Adjust with the Longitude-Latitude (**//**) command.
8. Note: The GPS will not update the day of the week.

In concert with the GPS, use the default Seasons and Triggers. **LightSeasons already has the year scheduled for dusk to dawn lighting. The objective is to turn on the lights in the dimmed hours of sunset. They remain lit till after midnight. And then re-illuminate in the early hours before sunrise. These triggers are preprogrammed into LightSeasons, ready to use, direct from the factory. See the Season Defaults in detail on page 6. To restore factory settings, us the Default Seasons *ds* command.**

Programming and Commands

LightSeason has a fundamental set of user commands. These requests will provide the current status, and/or configure the control parameters. The user must first establish Communication to the device; see User Interface / Comm Port.

Here are the general rules for entering a command or request:

- A prompt **'>'** will query for the next user request. It must be present to type a command.
- All commands are unique two-character abbreviations, this promotes very quick entry.
- Each command is executed after the ←enter key is pressed.
- Typing the command only, returns its current status. The same command followed by parameters (or values) will update the internal variables. All new values are immediately saved in Non-Volatile Memory.
- All command parameters are separated by a single space.
- Unrecognized commands get a **'?'** (question mark) reply.
- Press ←enter to repeat the last command; also it will index to the next season when applicable.
- Enter **'??'** for a quick Help Screen.

Time

The current time is viewed by entering the command ***tm*** ←enter. The time is displayed in the format ***hr:mn:sc***

To modify the time, use the same ***tm*** command, only followed by three values for hours, minutes, and seconds. Hours are specified as a 24 hour clock only... AM and PM are not used. The following example changes the time to 13 minutes, 45 seconds past 8 in the evening:

tm 20 13 45 ← (all values are separated by a single space).

Date

The date is accessed in a similar manner. To view the current date enter ***dt*** ←enter. The date is displayed as ***mn/dy/yr***

To Change the date follow the ***dt*** command with three values for month, day and year. The following example sets the date to February 29th, 2012:

dt 2 29 2012 ← (all values are separated by a single space).

Seasons and Triggers

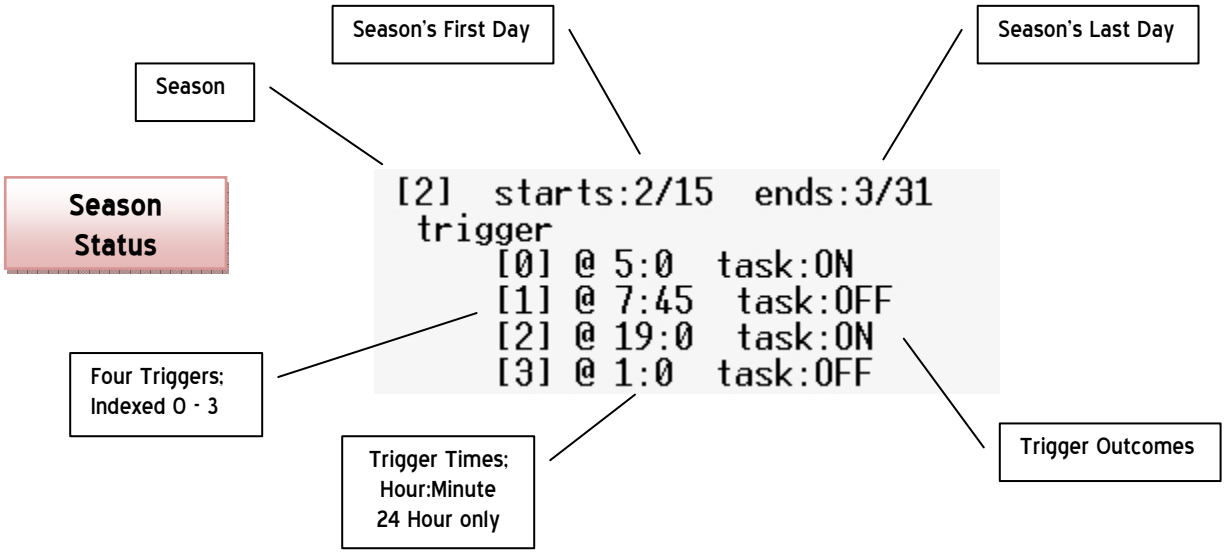
The active season is displayed using ***es*** ←enter. By repeating this command (with another ←enter) will automatically advance to the next season. The most recent season viewed remains active while a User exchange in is process. The Season Status (see next page) reveals the first and last date, and the particulars of its Trigger Events. To Change the start date follow the ***es*** command with three values that represent the season-index, month, and day. The following example sets the fourth season to begin May 17th:

es 4 5 17 ← (all values are separated by a single space).

The end of a season is defined by the Start Date of the next. Seasons are advanced in numerical order. Intermediate seasons may be reduced to a single day, and several seasons may occupy the same date.

Triggers are indexed zero thru three. They are executed based solely on their associated time, Yet, only one trigger is executed per given minute; and the lower index has priority. Modifying Triggers is only relevant to the present active season. To modify a trigger, use the ***et*** command followed by trigger-index, hour, minute, and task (One is On, and Zero is OFF).

Programming Commands

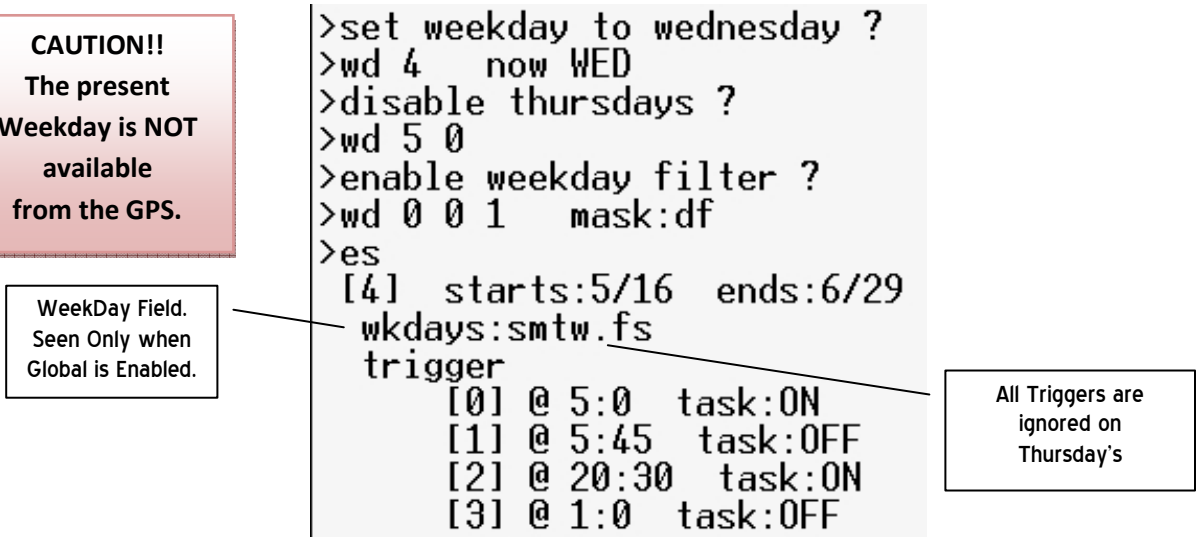


WeekDays

LightSeasons can enable or disable the Triggers by weekday. During normal operation, if a day is disabled, all triggers are ignored. Each Season has a unique Weekday Global Enable that turns this filter On (or Off). When the Global Enable is active, that Season's Status will include the Weekday Field. Enabled days are represented by letters. Disabled Days are dots. Input parameters represent Weekdays by numerical value, where one is Sunday, and seven is Saturday. In all cases to modify an enable, one is to activate, and a zero to disable.

- **To display the present weekday, Issue the WeekDay command *wd*+enter with no parameters.**
- **The WeekDay and one parameter sets the weekday.**
- **To en/disable a certain day, use two parameters. The first parameter is the day. The second the enable.**
- **To en/disable the Weekday Global use three parameters. Specify a range of seasons where the 1st parameter = 1st season and the 2nd parameter = final season. The 3rd parameter equals the enable/disable. If the 1st or 2nd parameters are zeros, then the active season is substituted.**

CAUTION!!
The present Weekday is NOT available from the GPS.



Programming and Commands

Command Reference

(Acceptable value range shown in parentheses)

CMD	*Param 1*	*Param 2*	*Param 3*	*Param 4*	DESCRIPTION / ACTION
dp					**Default Parameters** Reset/Restore environment variables to their default values.
ds					**Default Seasons** Reset/Restore the seasons and triggers to their default values.
dt	*Month* *(1 - 12)*	*Day* *(1 - 31)*	*Year* *(four digits)*		**Date** View/Update the current date;
es	*Season* *(1 - 8)*	*Start Month* *(1 - 12)*	*Start Day* *(1 - 31)*		**Edit Season** View/Select/Define a Season. Parameters define a season's begin date.
et	*Trigger* *(0 - 3)*	*Hour* *(0 - 23)*	*Minute* *(0 - 59)*	*Task* *(1=ON, 0=OFF)*	**Edit Trigger** View/Mod Triggers for the current Season. Parameters define time and task.
ll	*Latitude* *(x 100)*	*Longitude* *(x 100)*	*Zulu Time Adj* *(+/- 12)*		**Latitude Longitude** View/Define Geo Coordinates. Zulu Time-Zone Adjust: i.e. PST = -7 hours
lt					**Light** Toggle the Output On and Off.
tm	*Hour* *(0 - 23)*	*Minute* *(0 - 59)*	*Second* *(0 - 59)*		**Time** View/Update the current time; Format is 24-hour only! No AM or PM!
tc	*From Season* *(1 - 8)*	*To Season* *(0 - 8)*			**Trigger Copy** Copy triggers from one season to another; If destination is zero, copy to all seasons.
wd	*WeekDay* *(1 - 7)*	*Daily En/Dis* *(1=ON, 0=OFF)*	*Global En/Dis* *(1=ON, 0=OFF)*		**Week Day** View/Update the current day of the week. Set current wkday (no param 2 or 3)
zz					**Reset Controller** Time/Date return to last saved values.

Note: Press several rapid ←enter's to awake the LightSeasons from its low-power slumber. The command prompt (>) indicates success. You now have LightSeasons' attention. Low-power mode is re-entered ten minutes after the last user interaction.

Note: Remember to unplug the GPS, for it is a Power Drain! The Load/Lights are ON/blink while the GPS is active.

Default Seasons

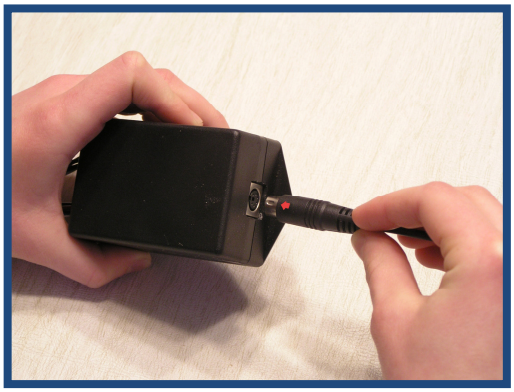
SEASON	1	2	3	4	5	6	7	8
Start Date	Jan 1st	Feb 15th	Apr 1st	May 16th	June 30th	Aug 14th	Sept 28th	Nov 12th
Trigger 0	5:00 ON	5:00 ON	4:00 ON	4:00 ON	4:00 ON	4:00 ON	5:00 ON	5:00 ON
Trigger 1	9:00 OFF	7:45 OFF	6:30 OFF	5:45 OFF	6:00 OFF	6:45 OFF	7:45 OFF	9;00 OFF
Trigger 2	17:45 ON	19:00 ON	19:45 ON	20:30 ON	20:30 ON	19:30 ON	18:00 ON	17:00 ON
Trigger 3	1:00 OFF	1:00 OFF	1:00 OFF	1:00 OFF	1:00 OFF	1:00 OFF	1:00 OFF	1:00 OFF

Default Parameters

Time 12:00:00
Weekday Wednesday
Date June 15th, 2011
Latitude 45.87 N
Longitude 122.50 W
Zulu Adj -7 hours (PST)

Weekday Enables: all are active.
Weekday Global: disabled.

User Interface / Comm Port



PS2 Port

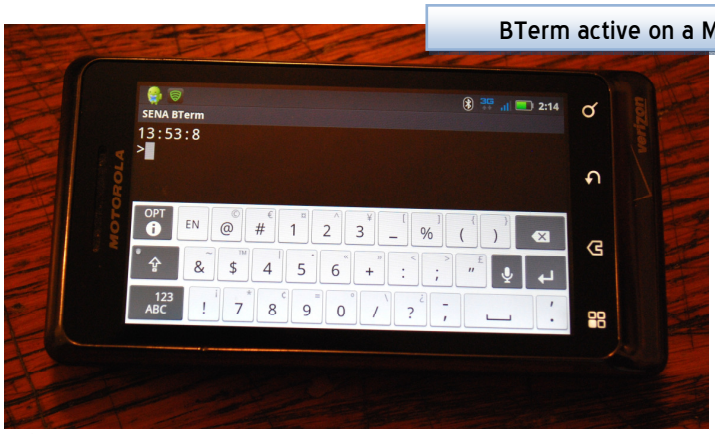
A serial port provides LightSeasons with a communication path. Thru it LightSeasons is able to interface with a GPS receiver, Bluetooth, and/or USB. The Comm Port is the PS2 Circular DIN connector. It has custom pin-out. This is Not a Mouse Port. To insert the Male PS2 connector, orient the embossed arrow(s) to Twelve O'clock, or away from the case mounting flange.

A Terminal Emulator is the program or platform to talk with LightSeasons. The rationale is to provide a simple and basic interface. The availability of the software and hardware tools are mainstream. Thus, User familiarity is likely. And the vital components are acquired effortlessly.

Android Cell Phone and Bluetooth.

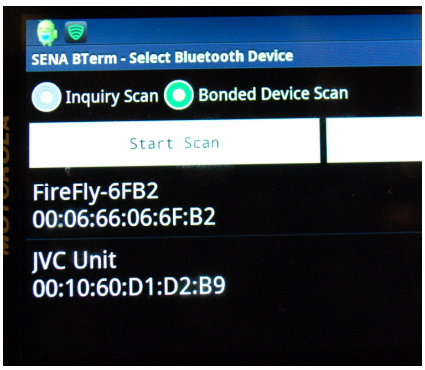
- Software Requirements: From the Android Market, download the free 'app' ***BTerm***, by SENA. BTerm is a terminal emulator for communicating wirelessly over Bluetooth. You'll find the Complete BTerm manual at the following website: www.sena.com/download/manual_bterm/connection.html

BTerm active on a Motorola Droid2



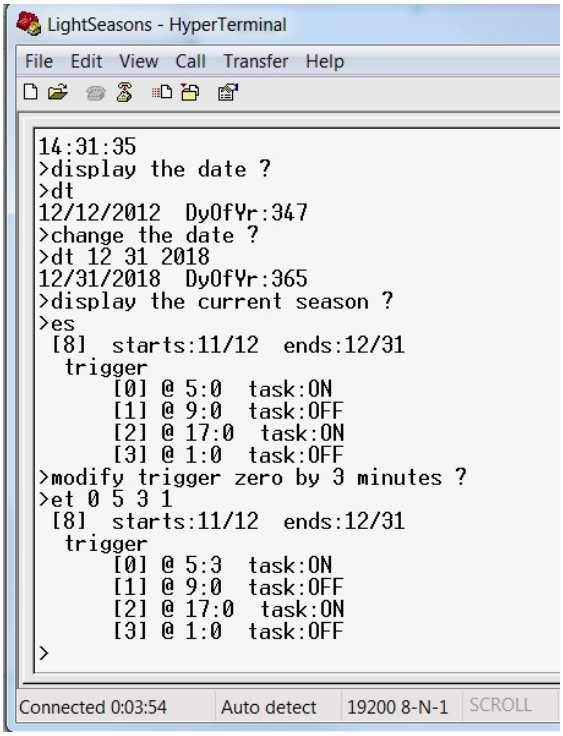
FireFly
(RN-240M)

- Hardware Requirements: An Android phone of course. And the popular FireFly™ USB-to-Serial adapter (RN-240M); made by Roving Networks. FireFly's are preprogrammed, ready to use, and available to purchase from our website at:
  http://www.xofw.com/lightseasons.html
  Give LightSeason's Bluetooth capability by inserting the FireFly into the DB9F/PS2 adapter (that's provided), and then into PS2 port. (For FireFly's purchased elsewhere, program them to the Port Settings seen on the next page.)
- USE:
  - Access your *PHONE's* Bluetooth Manager. Turn Bluetooth on, and 'Pair' it to the FireFly; Typically this is done thru 'Scan for Devices'. And the default Pass Code is 1234. It is normal for the Phone to indicate that it is 'Paired" but not connected.
  - Start the BTerm App.
  - Access the Bluetooth Manager in Options.
  - Press the ***connect to*** button. Press ***Select***.
  - Make sure Bonded Device Scan is active, then press ***Start Scan***
  - Select the FireFly. Press connect to
  - The main screen will display the elapsing time.
  - Press the ↵enter key rapidly to wake the LightSeasons from its sleep.
  - The Command Prompt > will indicate success.

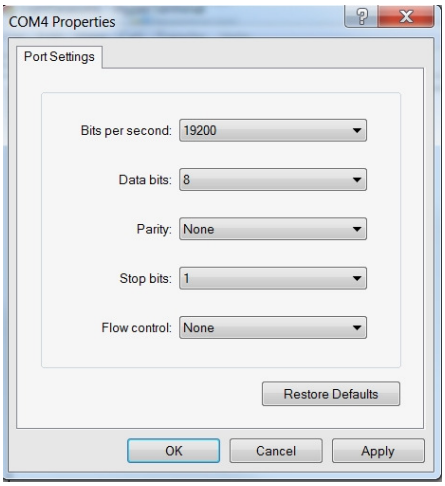


User Interface / Communications

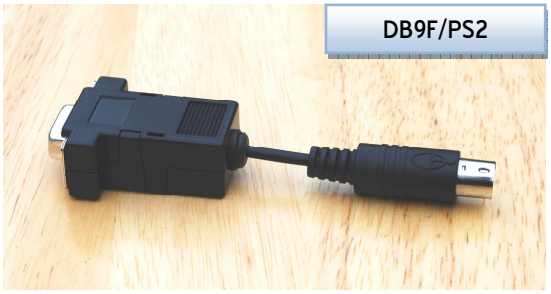
PC or Laptop



- Software Requirements: the popular Windows program ***HyperTerm*** (or similar) will work. HyperTerm is compatible with all flavors of Windows. And you can find a copy and install instructions at xofw.lskdflksjdlfkj.com



- Hardware Requirements: The User provides the communication cable necessary between the PC to the LightSeasons controller. For newer PC/Laptop's, use a USB-to-Serial Adapter cable (not included). They're common, inexpensive, and readily available in the marketplace. Watch-out for the really cheap ones, for they don't work with Windows 7!!! This one does work: GWC UC320 USB 1.1. Attach it to the DB9F/PS2 provided, and insert into the LightSeasons
- USE
  - Note: Prior to use, plug the USB into the Laptop and install the proper driver.
  - With the USB in the Laptop, attach the Serial end to the LightSeasons.
  - Open HyperTerm and start a New Connection.
  - Select the COMx Port that is associated the USB to Serial; it's likely HyperTerm will do it for you.
  - The proper Port Settings are shown above.
  - The main screen will display the elapsing time.
  - Press the ←enter key rapidly to wake the LightSeasons from its slumber.
  - The Command Prompt > will indicate success.
  - LightSeason commands are now accepted.



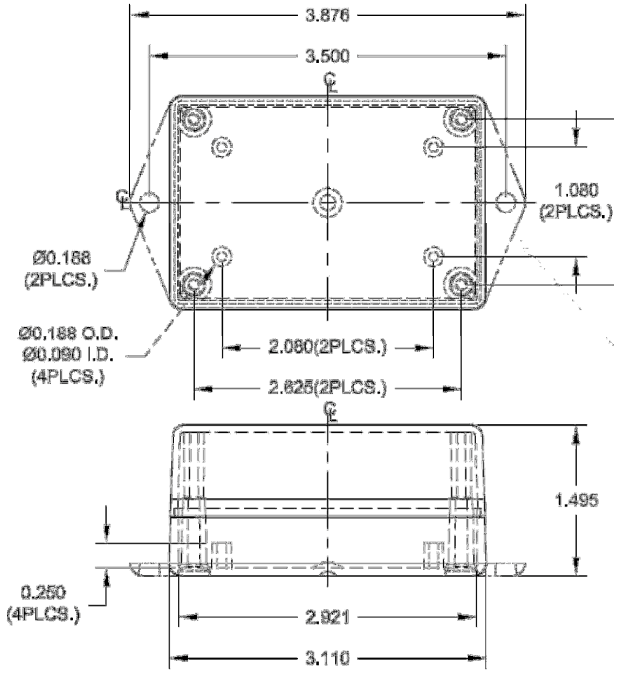
Specifications

LightSeasons has a four wire interface: two for Device Power (Battery+) and a Common (Battery- or Gnd. There's one for the Load Power Source (an input), and one for the Switched Load/Lights output. This light controller is powered solely from an external source; No internal batteries are required. Because of its minuscule power draw, LightSeasons will continue to operate on a severely discharged 12 Volt battery.

Condition	Value	Tolerance	Notes
Device Power	+12Vdc to +14Vdc, Regulated	Max: +16Vdc Min: +10.2Vdc	Tailored to +12V Batteries.
Tare Current	11 mA Typical Average	9ma asleep, 22ma awake	Fully Awake while Comm Port Active
Load Power Source	+5Vdc to +24Vdc	AC not tolerated.	
Load Current	2A max		Over Current Protection Required.
PS2 Power	+5Vdc @ 80mA	+/- 0.5Vdc	Used to power the GPS or Bluetooth
PS2 Comm	RS-232, 3wire		19200 Baud, 8bit, 1stop, No Parity
Battery+	RED Wire	18AWG, UL1007, 20inches	Device Power+ / Battery+
Battery-	BLACK Wire	18AWG, UL1007, 20inches	Common / Battery-
Power+	WHITE Wire	18AWG, UL1007, 20inches	Load Power+ Source (same common)
Light+	BLUE Wire	18AWG, UL1007, 20inches	Light+/Load + (same common)

Mechanical Layout

Mounting Holes: 2
Fastener Size: #8 Screw (not included)



Warranty. Xactrix of Washington warranties the LightSeasons Light Controller for one year.

Should this product malfunction or fail, please return it so we can make it right! Please see our policies page at www.xofw.com

THANK YOU FOR BUYING OUR PRODUCT!!

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